

CLAIMS

1. A computer-implemented method for adjusting the color of pixels in an image, each pixel having one or more color values, the method comprising:
 - identifying a target region of pixels in the image that represent an object, the object having a shape and a predefined set of features; and
 - 5 adjusting the color of one or more pixels in the target region by an amount determined based on one or more probability functions and one or more spatial profile functions, each probability function defining a probability value at each of the one or more pixels in the target region, the probability value representing the probability that the pixel corresponds to one or more features of the object, each spatial profile function being defined based on one or
 - 10 more spatial properties of the object or one or more of its features.
2. The method of claim 1, wherein the spatial properties include size.
3. The method of claim 1, wherein the spatial properties include shape.
4. The method of claim 1, wherein the spatial profile function is a sigmoid function.
5. The method of claim 1, wherein the spatial profile function is a Gaussian function.
- 15 6. The method of claim 1, wherein the spatial profile function is defined by a mask.
7. The method of claim 1, wherein identifying a target region of pixels includes:
 - receiving data that identifies the target region of pixels.
8. The method of claim 1, wherein:
 - at least one of the probability values represents the probability that the pixel corresponds
 - 20 to either a first feature or a second feature.
9. The method of claim 1, wherein:
 - the amount of adjustment increases as the probability value increases.
10. The method of claim 1, wherein:
 - the amount of adjustment increases as the probability value decreases.

11. The method of claim 1 wherein adjusting the color includes:
adjusting a first pixel by an amount determined based on a first probability value that corresponds to a first feature; and
adjusting a second pixel by an amount determined based on a second probability value
5 that corresponds to a second feature.
12. The method of claim 1, wherein:
the image is a photographic image including an eye exhibiting a redeye effect; and
the identified region of pixels corresponds to a portion of the eye that exhibits the redeye effect.
- 10 13. The method of claim 1, wherein:
the feature is one of skin, sclera, or redeye.
14. The method of claim 1, wherein adjusting the color includes:
adjusting the color to match a representative color for the region; and
using the probability values to modulate the amount of adjustment.
- 15 15. The method of claim 14, wherein the representative color represents an iris color for the eye.
16. The method of claim 1, wherein adjusting the color includes:
desaturating the color of pixels in a subregion of the region; and
using the probability values to modulate the amount of desaturation.
- 20 17. The method of claim 16, wherein:
the subregion is the center of the region.
18. The method of claim 16, wherein:
the subregion is an outer rim of the region.

19. The method of claim 1, wherein adjusting the color includes:

defining a region of pixels in the image that corresponds to the pupil of the eye, each pixel having a luminance value; and

reducing the luminance value of one or more of the pixels in the region.

5 20. The method of claim 1, wherein adjusting the color includes:

adjusting the color of a pixel based on the color values of pixels surrounding the pixel.

21. The method of claim 20, wherein adjusting the color of a pixel based on the color values of pixels surrounding the pixel includes:

defining a window of pixels surrounding the pixel;

10 determining a representative color for the window of pixels; and

adjusting the color value of the pixel to match the representative color for the window.

22. A computer-implemented method for redeye correction, the method comprising:

identifying a target region of pixels in an image, the target region corresponding to an eye exhibiting a redeye effect;

15 determining an iris color for the eye; and

correcting redeye in the target region by:

for every pixel in the target region, blending the color of the pixel with the iris color by an amount that is based on a redeye probability, the redeye probability representing the probability that the pixel corresponds to redeye.

20 23. The method of claim 22, wherein correcting redeye includes:

avoiding the correction of pixels that correspond to skin or sclera.

24. The method of claim 22, wherein correcting redeye includes:

applying extra correction to pixels that correspond to the ciliary margin of the eye.

25. The method of claim 22, further comprising:

25 eliminating redeye noise that is leftover from the correction.

26. A computer-program product, tangibly embodied in a computer readable medium, for adjusting the color of pixels in an image, the computer program product comprising instructions operable to cause data processing equipment to perform operations comprising:

identifying a target region of pixels in the image that represent an object, the object

5 having a shape and a predefined set of features; and

adjusting the color of one or more pixels in the target region by an amount determined based on one or more probability functions and one or more spatial profile functions, each probability function defining a probability value at each of the one or more pixels in the target region, the probability value representing the probability that the pixel corresponds to
10 one or more features of the object, each spatial profile function being defined based on one or more spatial properties of the object or one or more of its features.

27. The product of claim 26, wherein the spatial properties include size.

28. The product of claim 26, wherein the spatial properties include shape.

29. The product of claim 26, wherein the spatial profile function is a sigmoid function.

15 30. The product of claim 26, wherein the spatial profile function is a Gaussian function.

31. The product of claim 26, wherein the spatial profile function is defined by a mask.

32. The product of claim 26, wherein identifying a target region of pixels includes:
receiving data that identifies the target region of pixels.

33. The product of claim 26, wherein:

20 at least one of the probability values represents the probability that the pixel corresponds to either a first feature or a second feature.

34. The product of claim 26, wherein:

the amount of adjustment decreases as the probability value increases.

35. The product of claim 26, wherein:

the amount of adjustment increases as the probability value decreases.

36. The product of claim 26, wherein adjusting the color includes:

adjusting a first pixel by an amount determined based on a first probability value that
5 corresponds to a first feature; and

adjusting a second pixel by an amount determined based on a second probability value
that corresponds to a second feature.

37. The product of claim 26, wherein:

the image is a photographic image to include an eye to exhibit a redeye effect; and
10 the identified region of pixels corresponds to a portion of the eye that exhibits the redeye
effect.

38. The product of claim 26, wherein:

the feature is one of skin, sclera, or redeye.

39. The product of claim 26, wherein adjusting the color includes:

15 adjusting the color to match a representative color for the region; and
using the probability values to modulate the amount of adjustment.

40. The product of claim 39, wherein the representative color represents an iris color for the
eye.

41. The product of claim 26, wherein adjusting the color includes:

20 desaturating the color of pixels in a subregion of the region; and
using the probability values to modulate the amount of desaturation.

42. The product of claim 41, wherein:

the subregion is the center of the region.

43. The product of claim 41, wherein:

25 the subregion is an outer rim of the region.

44. The product of claim 26, wherein adjusting the color includes:

defining a region of pixels in the image that corresponds to the pupil of the eye, each pixel to have a luminance value; and

reducing the luminance value of one or more of the pixels in the region.

5 45. The product of claim 26, wherein adjusting the color includes:

adjusting the color of a pixel based on the color values of pixels to surround the pixel.

46. The product of claim 45, wherein adjusting the color of a pixel based on the color values of pixels to surround the pixels includes:

defining a window of pixels to surround the pixel;

10 determining a representative color for the window of pixels; and

adjusting the color value of the pixel to match the representative color for the window.

47. A computer-program product, tangibly embodied in a computer readable medium, for redeye correction, the computer program product comprising instructions operable to cause data processing equipment to perform operations comprising:

15 identifying a target region of pixels in an image, the target region corresponding to an eye exhibiting a redeye effect;

determining an iris color for the eye; and

correcting redeye in the target region by:

20 for every pixel in the target region, blending the color of the pixel with the iris color by an amount that is based on a redeye probability, the redeye probability representing the probability that the pixel corresponds to redeye.

48. The product of claim 47, wherein correcting redeye includes:

avoiding the correction of pixels that correspond to skin or sclera.

49. The product of claim 47, wherein correcting redeye includes:

25 applying extra correction to pixels that correspond to the ciliary margin of the eye.

50. The product of claim 47, further comprising instructions to:
eliminating redeye noise that is leftover from the correction.